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AUTHOR Holznagel, Donald C.
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ABSTRACT

This guide is designed to provide information on planning assistance and available options to schools that are preparing for the use of technology for curricular improvement. The information presented here is current as of March 1, 1992, and is most relevant to school districts in Alaska, Idaho, Montana, Oregon, and Washington. The first of six technologies discussed is communications satellite television, two-way audio. This section describes organizations that produce complete courses or units of instruction in a variety of subjects and levels for students. The second technology discussed is satellite television providing one-way television programming with no interaction between receiver and sender. This section describes organizations that provide supplementary materials for use by teachers rather than full instruction in courses. The third technology considered is broadcast and cable television, which require only standard television receiving systems in the school, although a telephone line is needed for two-way voice contact for one of the services, and another offers videoconferencing as well as instructional programming. The fourth technology described encompasses computer and telecommunications services, which rely on computers, modems, telecommunications, phone lines, and electronic mail systems to provide complete courses; supplementary instruction; or information via databases, bulletin boards, and networks. Other sources of assistance are then described, including the Education Satellite Network, statewide networks such as those in Montana and Oregon, and private companies. The guide concludes with a listing of subscription publications useful in selecting instructional and inservice opportunities through distance education systems. A brief guide to planning and decision making and a glossary of terms are appended. (DB)

THE Northwest Regional Educational Laboratory

TECHNOLOGY PROGRAM

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

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DISTANCE EDUCATION RESOURCE DIRECTORY FOR NORTHWEST SCHOOLS

Donald C. Holznagel

April 1, 1992

Northwest Regional Educational Laboratory
101 S.W. Main, Suite 500
Portland, Oregon 97204

Sponsored by OERI Office of Educational Research and Improvement U.S. Department of Education

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TABLE OF CONTENTS

Page

Introduction 1

Satellite Television, Two-way Audio 2
- ASTS 2
- ESP 3
- IREDS SatNet 3
- LiveNet 4
- Pacific Northwest Partnership 5
- SERC 5
- STEP 6
- TI-IN 7
- Triad Project 8
- NASA Satellite Videoconference 8

Satellite Television Only 9
- Channel One 9
- CNN Newsroom 9
- NASA Select 9
- SCOLA 10
- NOAA 10

Broadcast and Cable Television 11
- IREDS 11
- PBS 11
- Cable in the Classroom 12

Computers, Telecommunications 14
- Complete Courses 14
  - CCS 14
  - EDUNET 15
- Supplementary Instruction 16
  - AT&T Learning Network 16
  - NASA Telelectures 16
  - NGS Kids Network 16
  - WorldClassRoom 17
- Databases, Bulletin Boards, and Networks 17
  - Big Sky Telegraph 17
  - Computer PALS Across the World 17
  - FrEdMail 18
  - K12 Net 18
  - LabNet 19
  - Learning Link 19

Page

NASA SpaceLink 19
NOAA 20
Ostendorf On-Line 20
PSInet 20
X*PRESS/X*Change 21

Other Distance Education Assistance 22
ESN 22
State Telecommunications Networks 22
State Technology Coordinators 23
Private Companies 23

Information Resources 25
Programs and Production References 25
General Information References 26
Meetings and Conference 26

Curricular Cross-reference 29

Appendix 31

INTRODUCTION

Through the periodic regional needs assessments by the Northwest Regional Educational Laboratory (NWREL), many small rural school districts expressed interest in using technology to assist in solving the problems typical in small schools of lack of subject offerings in critical areas such as foreign languages and advanced math and science, and needs for staff development offerings in a convenient location. The Distance Education and Telecommunications Advisory Committee of the NWREL has recommended the development of this Directory as a means of addressing the problems of lack of information and planning assistance which can be a barrier to small schools in planning for the use of technology for curricular improvement.

The Directory has been designed to address two needs. First, there is a need to plan for technology in the curriculum. Many districts are developing long-range plans to ensure that options are examined in the light of curricular needs and that the costs are fully explored and projected. This requires not only identifying options but also their implications for staff, organization, and other factors.

A second need is for up-to-date information about the options. If a district is considering using distance education technologies, staff will need to identify the available systems, select the options appropriate to their needs, and contact representatives of the organizations providing the service.

The information in this Directory is current as of March 1, 1992. Because the field of telecommunications is constantly changing, and details of course offerings and cost from distance education producers changes at least yearly, a revision will be issued periodically. Information is included here which is most relevant to school districts in the Northwest states of Alaska, Idaho, Montana, Oregon, and Washington. Readers outside of the area will find options included which are not available to them, and might in turn have access to services not included here.

For information about services and options within a state, and about laws or regulations regarding staffing, usage, costs or other state-governed issues, please contact the appropriate state representative from the following list. They are all knowledgeable in distance education, telecommunications, computers, and other instructional technologies. For general questions, planning assistance, and other technical assistance, you may also call the author.

Alaska	Lois Stiegemeier	907/465-2644
Idaho	Ken Reed	208/334-2166
Montana	Ron Lukenbill	406/444-2080
Oregon	Kathryn Hansen	503/373-7698
Washington	Cheryl Lemke	206/586-2053
NWREL	Don Holznagel	503/275-9624

Satellite Television, Two-way Audio

This section describes organizations which produce complete courses or units of instruction in a variety of subjects and levels for students, and staff development courses or teleconferences for teachers. They all use live television delivered by satellite as a presentation medium supplemented by telephone for interaction between students and teachers, commonly called one-way video, two-way audio. Equipment can be acquired locally or through the delivering organization, and includes a satellite antenna, cabling to the classroom, receiving equipment, signal decoder, monitor, and phone line in the receiving classroom. Not all of the services are available in all states in the region. Subjects and topics may vary somewhat from year to year depending on demand, teacher availability, and the priorities of subscribers or governing boards.

Students must be enrolled in a course as they would in a school. Class sizes and process of student-teacher interaction vary, and class sessions are conducted on different patterns of three, four, or five days a week. A local school staff person, called a facilitator or monitor, is required. The person carries out tasks such as registration, attendance, discipline, test supervision, and liaison with the delivering organization. Some states require that the facilitator be a certified teacher, although not in the subject of the course being supervised, while in other states an instructional aide may be used. Schools are expected to have students participate in the live class sessions rather than by viewing videotape. In some cases, computer programs supplement classwork.

ASTS—Arts and Sciences Teleconferencing Service

Ms. Cathy Shuffield
Oklahoma State University
401 Life Sciences East
Stillwater, OK 74078-0276 Phone: 1-800/452-2787

Access: C-band, Galaxy VI, Ch. 19 and 23

Costs:

1-3 students	$725 each per course per year
4-9 students	$3,000 total for all

Computer software and instructional materials extra

Staff Development: $150 per program live, $200 videotape

Courses:

German I and II
AP Physics, AP Calculus
Basic English and Reading (Grades 7 and 8)
Getting Ready for the PSAT/NMSQT and SAT, Getting Ready for the ACT.

Schedule: Live-course sessions are conducted two or three days per week in the morning, with planned work in computer-based material, audio tapes, print material, or tests on the other days.

Instructors: Professors are selected from the staff of Oklahoma State University.

ESP–Educational Systems Programming

Educational Systems Programming
Northern Arizona University
P.O. Box 5751
Flagstaff, AZ 86011 Phone: 1-800/628-6266

Access: C-band satellite Galaxy 6, 99 deg. W., transponder 21, or schools may elect to use videotape. Interactive instructional software is provided, using Apple IIe, Macintosh, or IBM computers. Toll-free telephone call-in at scheduled times is used for student-teacher interaction. Enrichment Series units are on videotape and include interactive computer tutorials on Apple IIe, Macintosh, or IBM computers.

Cost: The Foreign Language Initiative is $100.00 per school plus $20.00 per student. The videotape option is available at $400.00 per grade level per school. The Enrichment Series is $250.00 per unit, or $1,100.00 for all five.

Courses: The Foreign Languages Initiative for 1992-93 includes Spanish for grades 1 and 4. The programs will be delivered in live sessions of about 25 minutes each, twice a week. Expansion of the program to grades 1-6 is planned in future years. Conversational Spanish for teachers is offered by satellite once a week for 12 weeks beginning Fall 1992. The Enrichment Series is on videotape only, and includes five instructional units in Geology of the Grand Canyon, Native American Cultures, and Mathematics, designed to be integrated into the elementary curriculum. A preview videotape is available.

IREDS SatNet

Rich Mincer
Idaho State Department of Education
Len B. Jordan Office Building
Boise, ID 83720 Phone: 208/334-2166

Access: Any school in Idaho can have access. The system is a network of satellite downlinks at over 100 schools across Idaho and several cable companies. The Idaho Cable Television Association has assisted in the distribution over local access cable. Through TCI, programming is distributed on local access channels in six large population centers in the state. Programs are available on Telstar 302 (T2), channel 22. (There is a possibility of moving to satellite F1 next year.) Schools outside Idaho which can access the signal may use the programming, but the content is specific to Idaho needs and context.

Costs: There are no subscription or usage fees.

Courses: Programming is primarily inservice training for teachers and school administrators. A wide variety of topics is addressed, including the use of technology, specific systems such as Learning Link, curricular methods in reading and math, early childhood education, education legislation, and others. Offerings may expand next year.

LiveNet

Dr. Carl O. Ellis
Associate Dean
College of Community and Continuing Education
University of Alaska—Anchorage
Building K, Room 122
3211 Providence Drive
Anchorage, AK 99508 Phone: 907/786-1379

Access: Contact Dr. Ellis. The service is designed to present courses for CEU, Carnegie, or university credit. Broadcasts are by low-power satellite to South Central and Southeast Alaska, primarily to military bases. A special arrangement has been made for the North Slope Borough School District to use the system for its secondary instruction.

Costs: Contact Dr. Ellis. All applications on the system are self-supporting.

Courses: Several departments of UAA present degree programs. Staff development courses of the State Department of Education will be available, and courses leading to certain master's degrees in Education such as Special Education. The North Slope Borough School District is using the system to send high school math courses to ten sites in the district. Access must be negotiated with Dr. Ellis.

Pacific Northwest Educational Telecommunications Partnership

Central Office:

Dr. Don Egge
ESD 101/Star Schools
East 4022 Broadway
Spokane, WA 99202 Phone: 509/536-0141

State Governance Board and Coordinators:

AK: Lois Stiegemeier or Donna Ostrowski-Cooley	907/465-2644
ID: Ken Reed or Rich Mincer	208/334-2166
MT: Ron Lukenbill	406/444-2080
OR: Wayne Neuberger or Kathryn Hansen	503/378-6405
WA: Cheryl Lemke	206/586-2053

Access: C-band satellite, SatCom 1R (F1), Ch. 22 and Ch. 18. Access also requires special computer equipment for data transmission. Contact your state representative for application information.

Costs: Major costs of development, training, and pilot sites are supported by a Star Schools grant during the period 1990-92. There are membership and student fees.

Courses: Courses include Applied Math, Career Paths, Principles of Technology, and Science and Technology. Courses are designed by the Partnership, and produced and transmitted by the STEP organization (see description below).

SERC—Satellite Educational Resources Consortium

Mr. Gary Vance
Executive Director
SERC
P.O. Box 50008
Columbia, SC 29250 Phone: 803/252-2782

Access: SERC courses are satellite-delivered television with telephone voice contact between teachers and students. The organization is a consortium, and members are large entities such as state education agencies and public television networks. No states or other agencies in the Northwest Region are members at this time; there are no local district users in the region.

Costs: Consortium membership minimum fee is $10,000. A surcharge is added to the minimum for course enrollments less than 750, ranging up to $80 per student if there are less than 150 enrollees. An enrollment fee of $420 per student per course per year is charged, with an additional lab fee of $70 in certain courses.

Courses: Courses are produced by several of the participating state networks such as Kentucky Educational Television (KET). They include Japanese, Russian, Latin, Physics, Probability and Statistics, Discrete Math, Precalculus, AP Economics, and World Geography.

STEP—Satellite Telecommunications Educational Programming

Dr. Ted Roscher
Telecommunications Division Administrator
STEP
East 4022 Broadway
Spokane, WA 99202 Phone: 509/536-0141

Access: C-band satellite, SatCom 1R (F1), Ch. 22 and Ch. 18. Courses are television with live telephone contact between teacher and students during class.

Costs:

Membership	$3,000 with inservice, $4,250 without inservice
Inservice	$1,750 per year for 50 staff, up to $5,750 over 200
1-7 Students	$490 per student per course per year
8-12 Students	$3,900 total
13-20 Students	$4,850 total
Enrichment	$1,000 total

Courses: Japanese, Spanish, Russian, Advanced Senior English. Inservice programs are provided on 18-22 topics in a school year. (See also Pacific Northwest Educational Telecommunications Partnership.) Enrichment programs are on a range of topics for elementary and secondary students.

Schedule: Live class sessions are conducted four days per week, with the fifth day reserved for testing and other local activities. Course schedules vary, and are set annually by a steering committee composed of members. Enrichment programs are four 50-minute sessions on consecutive Fridays. Staff development programs are one to four sessions conducted between 4:00 p.m. and 7:30 p.m., Pacific time.

Instructors: STEP employs teachers certified in Washington state, and who are approved in all states having participating schools.

TI-IN Network Inc.

Corporate Office:

TI-IN Network, Inc.
121 Interpark
Suite 300
San Antonio, TX 78216-1803 Phone: 512/490-3900

Representative for Montana, Idaho:

Greg Anderson
8757 West Cornell Avenue #7
Lakewood, CO 80227 Phone: 303/988-8654

Representative for Alaska, Oregon, Washington:

Dr. John Erickson
11301 N.E. Seventh Street, W-8
Vancouver, WA 98684 Phone: 206/253-2714

Access:

C-band satellite, Galaxy 3 (G3), Ch. 36
Ku-band satellite, Ch. 44
Cable—Jones Cable affiliates

Costs:

Annual Support and Service	$3,500-$5,950
Per Student per course per semester	$240-$290
Elementary courses	$175
Elementary and secondary enrichment	No Charge
Staff development	Included in support and service fee, or as a $1,000 option.

Courses:

French, German, Spanish, Latin, Japanese
Physics, Astronomy, Marine Science, Anatomy and Physiology, Principles of Technology
Calculus
Psychology, Sociology
(Advanced Placement credit options for Physics and Calculus)
Staff development programs are offered in over 20 topics in a school year.

Schedule: Live sessions are conducted five days a week between 5:00 a.m. and 2:00 p.m., Pacific time, including secondary, elementary, and enrichment. Staff development is conducted mainly between 2:00 p.m. and 6:45 p.m., Pacific time. Enrichment programs are 25-minute sessions conducted once and targeted at a variety of grade levels. The 1992-93 school year is August 26, 1992 to May 28, 1993.

Instructors: TI-IN employs experienced teachers who are certified, usually in many states.

Triad Project

Ms. Ann McLean
Puget Sound ESD
12320 80th Avenue South
Seattle, WA 98178 Phone: 206/439-6913

Access: Access is available to all school districts in Washington state. Access for schools outside the state is not available now, but future access through the Pacific Northwest Educational Telecommunications Consortium is a possibility. Satellite access information is available from the above office.

Costs: Districts may become members of the Triad Project at a cost of $600.00 for districts having less than 100 teachers, and $900.00 for those having more than 100 teachers.

Courses: Programs are currently for staff development purposes, addressing a variety of topics, and are produced quarterly. Program topics for 1992-93 were not available at the time of this printing, and may be obtained from the above office. Three or four programs are produced per year through the cooperation of the Washington Office of the Superintendent of Public Instruction and the Puget Sound ESD.

NASA—National Aeronautics and Space Administration

Satellite Videoconferences

A series of educational programs for teachers in aeronautics and space science topics is provided each school year. The conferences include an interactive component for viewer questions and discussion.

Videoconference Coordinator
NASA Aerospace Education Services
Oklahoma State University
300 N. Cordell
Stillwater, OK 74078 Phone: 405/744-7015

Satellite Television Only

The following services provide one-way television programming by satellite, with no interaction between receiver and sender. They do not provide full instruction in courses, but offer a variety of material which can be used by teachers to supplement and enrich regular courses in several ways. The television equipment required in the school is the same as for the services in the previous section, but no phone line is needed.

Channel One

Whittle Communications, through its Whittle Educational Network, provides Channel One, a daily 12-minute television news program designed especially for schools and delivered by satellite. In order to receive the program, a school is given the required satellite dish and other video equipment free of charge. Each program contains four 30-second commercials. The Network also offers The Educators' Channel to provide staff development, and The Classroom Channel to provide instructional enrichment programming.

Customer Service
Whittle Educational Network
505 Market Street
Knoxville, TN 37902 Phone: 1-800/445-2619

CNN Newsroom

The CNN television network provides a daily 15-minute news program designed and packaged especially for schools, and delivered through local cable systems or by satellite at 3:45 AM (ET). The program is free to schools and may be taped and played on any schedule for educational purposes. Instructional support materials are prepared for each program and delivered by the X*PRESS/X*Change cable service or by electronic mail for a small subscription fee.

Turner Educational Services, Inc.
One CNN Center
Box 105366
Atlanta, GA 30348-5366 Phone: 1-800/344-6219

NASA Select

NASA Select is the NASA television service. In addition to live coverage of space missions, informational and educational programming on space and related topics is provided including historical documentaries and new scientific information from continuing projects. Programming will occur in four-hour blocks starting at 9:00 a.m. Pacific time, Monday through Friday, repeated at 1:00 p.m., 5:00 p.m., and 9:00

p.m. Transmission is on SatCom F2R, C-band, transponder 13, 72 deg. W., frequency 3954.5 MHz, Audio 6.8 MHz.

Director, NASA Select
c/o Deputy Associate Administrator for Public Affairs
Code P
NASA Headquarters
Washington, DC 20546

SCOLA

The SCOLA organization provides access by satellite to native language television news programs live or by tape delay. Programs are available from over 30 countries. English translation is also provided. Their OutWrite service provides instructional support materials. Inservice workshops are also offered about once a month.

SCOLA
2500 California Street
Omaha, NE 68178-0778 Phone: 402/280-2362

NOAA—National Oceanographic and Atmospheric Administration

A variety of informational publications regarding the use of data from various federal centers is available to teachers. A free computer bulletin board service is available which contains several categories of information about satellite data. The Direct Readout Service provides direct access to transmissions from weather satellites.

NOAA Educational Affairs Office
Suitland & Silver Hill Roads, Rm. 0158
Suitland, MD 20746 Phone: 301/763-4690
NOAA.SAT Bulletin Board:
1-800/546-1000

Broadcast and Cable Television

The services in this section require only standard television receiving systems in the school. No satellite antenna is needed, and in the case of PBS courses, no phone line is required. However, in the IREDS system, a phone line is needed because two-way voice contact between student and teacher is part of the design. An IREDS course is conducted in the same manner as those from STEP and others described in the first section, while PBS courses may be as easily viewed on videotape as by broadcast.

IREDS—Idaho Rural Education Delivery System

Mr. Ken Reed or Mr. Rich Mincer
Idaho Department of Education
Len B. Jordan Office Building
Boise, ID 83720 Phone: 208/334-2166

Access: The television portion is openly broadcast by all stations of the Idaho Public Broadcasting System. Participation by students requires enrollment by the district. The district is required to provide live telephone contact with the teacher during class. Access is not available outside Idaho.

Costs: Registration is $100 per student per year. Text, instructional materials, and long distance phone costs are extra. A FAX machine for each site is provided by the state. There are plans to use a computer in each site in the future, the cost of which will be borne by the district.

Courses: Spanish I and II, Math Analysis (pre-Calculus). Courses are produced at the Simplot-Micron Center at Boise State University, and transmitted to the public television system.

Schedule: 11:00 a.m. to 3:00 p.m.

Instructors: Instructors are certified teachers who are employed in the Boise School District.

PBS—Public Broadcasting Service

General information:

Public Broadcasting Service
1320 Braddock Place
Alexandria, VA 22134 Phone: 703/739-5038

Videoconferences:

Francis Thompson or Tom Flavel Phone: 703/739-8495

Access: The PBS Elementary/Secondary Service provides instructional programming to PBS affiliate stations or state PBS affiliate organizations. Contact your local station or state public broadcasting agency for offerings and schedule. Oregon Public Broadcasting provides a video library arrangement in which all educational programs for classroom use are broadcast between 5:00 and 7:00 a.m. daily specifically for taping by Oregon schools. KCTS-Seattle provides programs to K-12 schools by daily broadcast and video library, teacher inservice, and the Learning Link service.

Costs: Varied, but sometimes free to schools if license fees are paid by the station or other sponsor. Videoconference costs are usually passed on to participants in the form of a registration fee.

Courses: Programming is of three types: full courses, instructional supplements, and staff development videoconferences. Full courses in foreign languages, math, and science are developed by the Annenberg/CPB project. Instructional supplements are individual programs or short series intended for classroom use. Staff development videoconferences are single sessions or series developed in conjunction with educational organizations such as ASCD and NCREL, which incorporate periods of live interaction between panelists and viewers.

Schedule: Varied. Contact your local station or state PBS agency. Statewide agencies are:

Idaho Educational Public Broadcasting System	Jerry Garber 208/385-3727
Oregon Public Broadcasting	Steve Johnson 503/293-1909

Cable in the Classroom

General information:

Cable in the Classroom
1900 North Beauregard Street
Suite 108
Alexandria, VA 22311 Phone: 703/845-1400

Access: Through your local cable company. Member channels include A&E, Bravo, CNN, C-Span, The Discovery Channel, The Learning Channel, The Monitor Channel, Mind Extension University, The Weather Channel, and others.

Cost: There is no programming charge by the providers, but connection or service charges may be levied by the local cable company depending on the franchise

requirements. There are minimal costs for some instructional support materials from some channels. *Cable in the Classroom* magazine is free (see p. 25).

Courses: All programming is supplementary instructional material except for that from the Mind Extension University. Many of the member channels provide classroom kits and study guides to assist teachers in classroom use of the programming. (See *Cable in the Classroom* magazine for contact references.) The organization has arranged with its member channels for blocks of programming designed for education which are commercial-free, occur in regular weekly time periods, and have liberal copyright clearances.

Computers, Telecommunications

Services presented in this section rely on computers, modems, telecommunications software, phone lines, and electronic mail systems to provide a variety of services, including full-course individualized instruction, organized student group interaction, student-mentor communication, and special bulletin boards or databases. The school site is required to have a phone line in addition to the computer equipment, but no satellite antenna or other television equipment. Ongoing costs include telephone line charges and in some cases subscription fees.

The full course options require student registration and assume completion in a standard time period such as a semester. The organized supplementary instruction options also require registration and the activities are expected to take place within a specified period.

Complete Courses

CCS—Centralized Correspondence Study

Centralized Correspondence
Alaska Department of Education
3141 Channel Drive, No. 100
Juneau, AK 99801-7899 Phone: 907/465-2835

Access: Enrollment is by individual student, although a group of students in a school may take the same course at the same time. Enrollment is available only to Alaska residents. Course materials are sent by regular mail. Access is provided to the UACN electronic mail system for timely student-teacher contact. Courses are being rewritten to incorporate electronic mail as a standard tool. Periodic telephone conference calls are used during a course for group interaction involving all students whether at home or in school.

Costs: Charges are made for course materials and e-mail usage.

Courses: A full range of courses in the Alaska secondary and elementary curriculum is available, including sciences, mathematics, social studies, language arts, and others.

Schedule: Students are enrolled on a semester or school year basis and are expected to complete a course within a standard period of time.

Instructors: Certified teachers are employed in CCS to develop courses and act as the teachers of courses in progress, receiving student work and tests and providing guidance.

EDUNET

Mr. H. Lee Holmes
EDUNET
P.O. Box 9121
Helena, MT 59604

Phone: 406/442-0085
FAX: 406/449-4062

Access: The system is based on electronic mail and file transfer. The receiving site needs a microcomputer with printer, modem, and a telecommunications software package, and uses ordinary phone lines to reach the central computer. Computer access information is provided at registration, and general information is available to anyone without enrollment by logging on as "STRANGER". The phone number above is for both voice and computer contact, with a sensor to tell the difference. Modem speed can be 300, 1200 or 2400 baud.

Costs: $250 per student per course per semester, staff development same rate. Cost of long distance calls not included.

Courses: Approximately 50 courses are available, representing a wide range of curricular areas including math, science, foreign languages, business, and others. Courses are designed as individualized instruction. Student instructions and course materials are stored in computer files which are downloaded to the school microcomputer when requested. Criterion-referenced, end-of-unit tests are presented in an on-line session of about ten minutes at the student's request, and are scored immediately. Student-teacher interaction is primarily by electronic mail, although telephone conversations can take place when teachers are available.

Schedule: Courses generally follow the school calendar. Courses are designed for individualized, self-paced instruction, although completion is expected to coincide with the end of the school semester. Course offerings in a given semester depend on the demand and available teachers.

Instructors: Teachers certified in the subject area of the course are allowed to design, develop, and teach a course. A course may be taught by a teacher who did not develop the course. Development consists of the design of lessons and development or selection of instructional materials. Teaching consists of guiding students through the completion of a course, checking and grading work, and responding to student questions and discussion.

Supplementary Instruction

AT&T Learning Network

Schools may subscribe to participate in instructional units involving classes in up to nine schools in different geographic areas, including foreign countries. A group of schools is called a Learning Circle. Students may study in one of five different topic areas, and use the network to share ideas, projects, observations, and other information with other classes in their circle. Fees range from $195 to $375 per session depending on length, and include instructional materials, software, and communications.

AT&T Learning Network
P.O. Box 4012
Bridgewater, NJ 08807-4012 Phone: 1-800/367-7225

NASA Telelectures

The NASA Langley Center supplies a live audio lecture and discussion by telephone supported by 35mm slides at the receiving site. After a reservation is made, a slide carousel cartridge is sent to the local sponsor (school or organization) to be shown in combination with the phone presentation from Langley. The only cost is for the return mailing of the carousel. Adherence to a precise schedule is important at the receiving site.

Telelecture Programs
NASA Langley Visitor Center
Mail Stop 480
Hampton, VA 23665-5225 Phone: 804/864-1593

NGS Kids Network

The National Geographic Society offers this program to provide elementary and middle school student research activities organized around topics in ecology and the environment. Four eight-week units are now available, conducted on a schedule set by the Society. Students engage in local research, then compare data, hypotheses, and conclusions with students in other parts of the country who are involved in the same investigation at the same time. Materials are $325 to $375 per unit, plus $97.50 for tuition and telecommunications.

National Geographic Society
Educational Services
Department 5413
Washington, D.C. 20036 Phone: 1-800/368-2728

Also available through IBM marketing representatives and the *IBM Software for Education Catalog*. Call your local representative or 1-800/IBM-3327.

WorldClassroom

WorldClassroom is a subscription service of GTE Directories Corporation. It provides an on-line network connecting schools in a dozen countries in North and South America, Europe, and the Pacific. Student activities are provided in five areas: Welcome, Science, Social Studies, Language Arts, and Special Projects. There are special conference areas in addition to the core. Classes are organized around clusters of about eight geographically diverse schools, with a lead teacher coordinating lesson plans. Students are involved in data sharing, problem solving, and writing activities. Long distance costs are avoided by the provision of toll-free numbers. Subscriptions are monthly at $99.00 per month including on-line cost, or school year at $475.00 for curriculum plus $18.00 per hour on-line.

GTE Directories
Attn: WorldClassroom
P.O. Box 165008
Irving, TX 75016-5008 Phone: 1-800/950-4483

Databases, Bulletin Boards, and Networks

Big Sky Telegraph

Big Sky Telegraph provides electronic mail and a wide range of bulletin board services to education and community agencies in several states. Rural schools and communities and the 116 one-teacher schools in Montana are major user groups of the network. Through the system, teachers have access to the information and software resources of the college, some college credit courses, and assistance from college faculty. National and international contacts are available. A subscription fee of $50 per person per year is requested, but not required for access. New users may browse on a guest account. Transmission settings are 1200 Baud, 8-N-1.

Frank Odasz
Big Sky Telegraph
Western Montana College
Dillon, MT 59725 Phone: 406/683-7338
Computer: 406/683-7680

Computer PALS Across the World

The focus of this project is on the improvement of student writing and communication skills through the sharing of letters, reports, poetry, and other work between individuals or groups of students in different schools by electronic mail. Student groups can collaborate on work in several curriculum areas or discuss major

current events. Over 100 schools in the U.S. and several other countries currently participate. PALS uses the commercial Tymnet telecommunications system.

Emily Valdez, Associate Director
Computer Pals
P.O. Box 1206
Lake Oswego, OR 97035 Phone: 503/691-1689

FrEdMail

FrEdMail is a network composed of many local electronic mail and bulletin board systems which operate independently during the day and transfer files between sites at night. The major goal is to motivate writing and communication skills. Students may do their writing off-line, and the collected writings of a group may be shared with another group in another part of the country by transmitting batches at night. Participating through an existing local node is free. There is a cost of $60 for the software to establish a local system to serve up to 100 users. The newsletter has an annual subscription fee of $10, and handbooks and training materials are available at low cost.

FrEdMail Foundation
Box 243
Bonita, CA 91908-0243 Phone: 619/475-4852

K12 Net

Operators of bulletin board systems (BBS) in educational agencies in the U.S. and Canada formed this network in September, 1990, to promote student-student and teacher-teacher contacts on a national and international basis. The network is a loose organization of over 100 local BBS which use the FIDO BBS software system. Although each local system is autonomous, files of communications are exchanged between local systems. Echo forums are set up in the major curriculum areas so that all messages in a specific curriculum or topic area are shared with all those interested in the same area. Forums are also set up to accommodate short-term classroom projects involving student groups in any part of the network. The system is inexpensive to the user, with access to free international telecommunications. Connections may be made to Canada, Australia, and eight countries in Europe.

Jack Crawford
Wayne-Finger Lakes Teacher Resource Center
3501 County Road 20
Stanley, NY 14561 Phone: 716/526-6431

LabNet

The LabNet project is operated by the Technical Education Research Centers (TERC) with funding from the National Science Foundation. Its purpose is to stimulate the use of project approaches and hands-on activities in physics instruction through the use of computer-based activities. A nationwide electronic mail and bulletin board network has been formed for teachers involved in that approach to share ideas and teaching techniques, discuss issues, and consult with university physicists.

LabNet Project
TERC
2067 Massachusetts Ave.
Cambridge, MA 02140 Phone: 617/547-0430

Learning Link

This system is usually located at and managed by a local or state public television station, and offers electronic mail, bulletin board, and database facilities. The primary database contains scheduling and descriptive information on instructional television programs and related supporting print materials. (See Ostendorf On-Line on the next page). Other databases and bulletin boards can be established by the local manager. The system was designed to enable public television stations to improve their support of schools and to help teachers make better use of instructional television, with the flexibility to allow them to communicate for other reasons as well. Stations pay a fee to install and use the system. In the Northwest region, Learning Link is installed at Idaho Educational Public Broadcasting System and at KCTS/Channel 9, Seattle, Washington. For information, contact your local public television station or the address below. A companion service called IntroLink provides individual subscriptions to schools not served by a local system.

Learning Link National Consortium
Central Educational Network
1400 East Touhy, Suite 260
Des Plaines, IL 60018 Phone: 708/390-8700

NASA SpaceLink

A free computer bulletin board system for teachers which provides information in 10 menu items about NASA programs, instructional plans and activities, and some NASA publications which can be downloaded. Access is available at rates of 300 to 9600 Baud. Information on access through the Internet is available under menu item 2.

SpaceLink Administrator
Marshall Space Flight Center
Mail Code LA-20
Huntsville, AL 35807

Phone: 205/544-6527
Computer System: 205/895-0028

NOAA—National Oceanographic and Atmospheric Administration

A variety of informational publications regarding the use of data from various federal centers is available to teachers. A free computer bulletin board service is available which contains several categories of information about satellite data. The Direct Readout Service provides direct access to transmissions from weather satellites.

NOAA Educational Affairs Office
Suitland & Silver Hill Roads, Rm. 0158
Suitland, MD 20746

Phone: 301/763-4690
NOAA.SAT Bulletin Board:
1-800/546-1000

Ostendorf On-Line

This is a service of the publisher of *At A Distance* described in a later section. It is an on-line database of distance education program scheduling which is updated daily, and is designed to supplement the printed catalogs with highly current information. It is provided through the Learning Link and Intro Link systems described in this section. Special arrangements for access at reduced rates have been provided to schools in the Northwest states because of a joint development effort. Contact your state technology coordinator for details of access in your state.

PSInet

The People Sharing Information Network (PSInet) is the name of software designed for conducting conferences by telecommunications using IBM-compatible microcomputers. A network host system may be established by anyone. Participants at each station can do most of their work off-line, and files are sent to and received from the host system (also a microcomputer) in batches for speed and economy. In addition to messages between members, the system handles sessions and papers in a conference format. Messages and conferences may also be exchanged between PSInet networks. Standard telephone service is used for all connections. Major groups of users have been formed by the National Education Association and the Council of State Science Supervisors. Many science supervisors are forming teacher networks within their states. Software for either a host station or a user work station may be purchased from IBM Corporation.

For further information, contact the IBM Educational Representative for your area. Science teachers should also contact their state science supervisor.

X*PRESS/X*Change

X*PRESS Information Services Ltd. provides information services through cable television lines to schools and homes through a service called X*Change. On-line access is provided to newswire services from several countries including the Soviet Union, Germany, and Japan, and to other services such as Standard and Poor's stock quotes. A conferencing service enables students and teachers to communicate with others across the country on topics of importance to them.

X*PRESS Information Services Ltd.
P.O. Box 4153
Englewood, CO 80155 Phone: 1-800/7PC-NEWS

OTHER DISTANCE EDUCATION ASSISTANCE

ESN—Education Satellite Network

ESN is a school district service developed and operated by the Missouri School Boards Association. It provides equipment, technical assistance, and programming in a package to assist school districts with access to distance education services from a variety of sources. Outside Missouri, services are provided through an agreement with state school boards associations. In the Northwest, the Idaho and Montana associations have such agreements. Districts in those states may use the following contacts to investigate the service:

Idaho: Vicki Weber, ISBA, 208/342-6411
Montana: Bob Anderson, MSBA, 406/442-2180

ESN charges a membership fee which supports its services, some of which are listed below. They are packaged in various combinations at different cost levels.

Hardware—antenna and related equipment, and in-school video and telephone equipment.

Monthly Program Guide—describes programming and schedules.

Enrichment Programs—ESN licenses viewing and taping rights for programming from a dozen vendors including SCOLA, Classroom Earth, and others.

Inservice—staff development programs and teleconferences are produced by ESN and other agencies.

Instructional Programming—ESN will assist districts in arranging contracts with major course producers such as Oklahoma State University, but does not pay the fees.

State Telecommunications Networks

The states of Montana and Oregon are developing statewide networks which will ultimately be capable of providing a wide range of services including television and data transmission. In both states, some services began in 1990-91 and are being developed over a period of three to five years. Elementary and secondary school services are being coordinated with the state education agencies. (The Oregon Department of Education will sponsor courses in Marine Science for high schools and middle schools on ED-NET.) Districts in those states may contact the following:

Montana: METNET, Ron Lukenbill 406/444-2080
Oregon: ED-NET, Christie Leonhardt 503/293-1998

State Technology Coordinators

Each of the state education departments in the Northwest has staff who are assigned responsibilities for aspects of distance education and telecommunications, including providing information and assistance to districts. They are the same state representatives listed in the introduction of this booklet.

Private Companies

Frequently, corporations are willing to provide assistance to school districts in areas of their expertise. School district personnel probably know of companies in their local area which have knowledge in telecommunications, such as the telephone, cable television, and broadcast television companies. Described in this section are organizations whose work covers a wide area of the region, and whose staff are available for planning services or other assistance, usually in relation to extending their business.

U. S. West Communications

This company provides telecommunications services in 14 western states, and has a central staff dedicated to planning and marketing distance education systems and services. They are particularly interested in two-way interactive video and audio systems, implemented in a locally controlled system serving one or more districts in an area. The company is working with schools in projects in Minnesota, Arizona, and other states and has supported the annual Montana Distance Learning Conference. The company maintains a foundation to fund research and development activities in the field. Education representatives are in four of the five states in the region:

Idaho: Phil Ruebel 208/385-8668
Montana: Michele Burchett 406/441-7603
Oregon: Tom Atkinson 503/484-7946
Washington: Ezra Robinson 206/345-3862

TCI Communications Inc.

The TCI organization provides cable television services in many areas of the Northwest region. Corporate policy is to serve schools, but the type of assistance may vary because each state organization is operated independently of the others in the corporation, and local networks are independently managed. The Oregon company, for example, has installed X-Press free in all schools in their service area which have requested it. All of the local companies distribute the *Cable in the Classroom* magazine to schools free of charge. The corporation is sponsoring a demonstration school in West Linn, Oregon, and has supported the Montana state network.

The regional office and contact person for education is:

Ms. Cindy Eichner
TCI West
1215 114th Avenue S.E.
Bellevue, WA 98004 Phone: 1-800/446-1882

State or local company contacts may be obtained from Ms. Eichner.

INFORMATION RESOURCES

Programs and Production References

The following subscription publications may be useful to educators in the process of selecting instructional opportunities for students and inservice opportunities for teachers through distance education systems. All three provide information on programs, courses, time schedules, and access. They differ in coverage and frequency of issue. The first one addresses several distance education systems including nontelevision options while the second and third deal only with satellite-delivered television options.

At A Distance
Virginia A. Ostendorf, Inc.
P. O. Box 2896
Littleton, CO 80161-2896
$50 per issue, two issues per year.

Satellite Learning Program and Resource Guide
EnterACT Corporation
P. O. Box 409
League City, TX 77574-0409
$120 per year, major issues Spring and Fall, updates Summer and Winter.

Satellite Scholar
Eagle Publishing
2347 South Avenue West
Missoula, MT 59801
$69 per year, issued monthly with expanded quarterly issues.

The following publication is distributed free of cost to schools by many cable companies, although it can also be obtained by subscription if necessary from the address below. It is published monthly during the school year, and contains schedule information organized by subject for the full range of educational programming from the *Cable in the Classroom* member channels. The magazine also contains a taping calendar, articles, and instructional planning aids.

Cable in the Classroom Magazine
80 Elm Street
Peterborough, NH 03458 Phone: 603/924-0612
$18.00 per year, or free from cable company

General Information References

The following publications offer information on the range of delivery options, school district plans and examples, issues, problems, and future developments.

A Depiction of Distance Education in the Northwest Region
Document Reproduction Service
NWREL
101 S.W. Main, Suite 500
Portland, OR 97204 Phone: 503/275-9518
$4.45

Linking For Learning: A New Course for Education
U.S. Congress, Office of Technology Assessment
Order from:
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402-9325 Phone: 202/783-3238
$9.00, Stock No. 052-003-01170-1

Planning for Telecommunications: A School Leader's Primer
NSBA
P.O. Box 17316
Baltimore, MD 21203
1-4 Copies, $12.00 each

Barker, Bruce O. *The Distance Education Handbook: An Administrators Guide for Rural and Remote Schools*
ERIC Clearinghouse on Rural Education and Small Schools
AEL
P.O. Box 1348
Charleston, WV 25325
$14.00 each

Meetings and Conferences

A great deal of general and specific information including progress reports and school district experiences is available at conferences and association meetings. The following list is intended to indicate the opportunities in the Northwest region. Information on dates and costs may be obtained from the responsible organization or state technology representative.

AACED–Alaska Association for Computers in Education

Meets annually for two or three days in April in Anchorage. Sessions cover a wide range of topics on the instructional use of computers, telecommunications, and related technologies.

Lois Stiegemeier
Alaska Department of Education
P.O. Box F
Alaska Office Building
Juneau, AK 99811
Phone: 907/465-2644

ACPE–Association for Computer Professionals in Education

Meets semi-annually in November and April, in major cities between Eugene and Seattle. Meetings are one day and focus on a specific predetermined topic, usually with an emphasis on administrative applications in education. Telecommunications and networking are often on the agenda.

Chuck Hadduck
Data Processing Department
Portland Public Schools
P.O. Box 3107
Portland, OR 97208-3107
Phone: 503/249-2000

Montana Distance Learning Conference

Conducted annually for two days in March, at locations in Montana. The conference is sponsored by the EDUNET organization and the Montana Office of Public Instruction, with the additional support of other companies and agencies in the region. The sessions deal with various aspects of distance education and telecommunications in instruction.

EDUNET
P.O. Box 9121
Helena, MT 59604
Phone: 406/442-0085

NCCE–Northwest Council for Computers in Education

Conference conducted annually for three days in February, at various sites in Oregon and Washington. Sessions and workshops focus on instructional applications of computers and related devices, and on computer-based telecommunications.

NCCE
2501 S.W. Sunset Boulevard
Portland, OR 97201-1219

NorthWestNet

An annual meeting is conducted in the region in the Fall, which is open to nonmembers. The meeting has sessions relevant to K-12 schools as well as universities, and the content has a heavy emphasis on the use of the Internet for broadband telecommunications in instruction at several levels. NorthWestNet is a private, nonprofit organization formed for the purpose of coordinating access to the Internet and providing technical assistance to members.

NorthWestNet
Suite 202
15400 S.E. 30th Place
Bellevue, WA 98007

Phone: 206/562-3000

Curricular Cross-reference

For assistance in planning the role of distance education and telecommunications options in the curriculum, this list groups the various service options according to whether they purport to offer complete instruction as in a full course, or material and activities which are intended to be supplementary to the regular curriculum, enriching or extending the experiences of students. The icon will indicate the type of technology used and the section in which the description of the option is located.

Full Courses

ASTS
CCS
EDUNET
ESP
IREDS
IREDS SatNet
LiveNet
Mind Extension University (Cable in the Classroom)
PBS
Pacific Northwest Star Schools Partnership
SERC
STEP
TI-IN
Triad

Instructional Supplements

AT&T Learning Network
Big Sky Telegraph
Cable in the Classroom
Channel One (Whittle)
CNN Newsroom
Computer PALS Across the World
FrEdMail
K12 Net
LabNet
Learning Link
NASA Select
NASA Spacelink
NASA Telelectures
NASA Videoconferences
NGS Kids Network

NOAA Direct Readout Service
NOAA.SAT Bulletin Board
PSInet
SCOLA
WorldClassRoom
X*Press/X*Change

APPENDIX

PLANNING AND DECISION MAKING

As in any instructional program in a school district, a decision to use distance education has implications for a number of areas of concern to administrators and teachers, described briefly here.

Staff

In all distance education programs, the student is separated from the primary instructor, which usually generates a need for some attention from staff at the student's location. Consideration should be given to the following areas.

Tasks—a staff member, either a professional or an aide, should be responsible for the direct supervision of students. The person is usually identified as a facilitator or monitor. When an aide is used, a certified staff member is sometimes identified as responsible for grading and credit. Some states have laws or administrative rules which require teacher certification or a special training course for aides. Some providers of distance education courses prescribe the role of a facilitator for a receiving site in their system. The following task areas are common to most situations.

Prepare equipment and supplies
Perform recordkeeping
Maintain discipline
Provide feedback to the instructor
Serve as liaison with the delivering agency
Monitor homework
Administer tests
Provide understanding and support to students

Time—Even though not involved in presenting information, the local staff members need time to carry out the local tasks. Also, in the satellite courses, the originating teacher conducts television sessions three or four days each week, leaving one or two days for specified local activities for which some preparation may be needed.

Training—Two types of training should be considered. First, the facilitator should receive training for the tasks of the position, usually provided by the distance education delivery agency either on site or by telecommunications. Second, the success of a distance program also depends on the support and good will of the rest of the teachers in the receiving school. An inservice program to educate the staff about the nature of the distance program and its implications for students and staff is an important component of preparation to achieve that support.

Environment

Several components of the receiving site need attention.

Space—Adequate room is needed for the number of students and equipment involved, with controllable light for desk work and television viewing.

Power—Enough electrical outlets are needed for the devices required for a receiving station, which might include TV, VCR, computer, printer, FAX, etc.

Telecommunications—In most systems, a direct phone line is required which does not pass through a switchboard where a call may be interrupted by an operator or other voice user. The ability to run cable to the room from an outside antenna is needed in television systems.

Back-up—To assure a cohesive instructional session with minimum interruption, it is important to identify back-up units in nearby rooms for the various technical components which could fail, including TV, computer, VCR, etc. Back-up videotapes and computer software should also be on hand.

Security—Depending on the climate and experience in a specific school, some consideration might be given to providing a locked space for containing the equipment when not in use.

Noise—The sound from television programming, like that of films, could be a problem for other nearby instructional spaces. Also, in some systems, students will be talking on the phone. The same consideration for noise should be given as in a regular classroom.

Support

Depending on the type of system in use, there may be other considerations for which advance planning and budgeting is important.

Maintenance—Computers and printers need occasional maintenance attention, and so do television monitors and other video equipment, although usually not as often. Identifying the closest local option and providing a budget to cover problems will reduce the potential down time in case of component failure.

Supplies—Printer paper, videotapes, and other supplies may be needed for the room. In some cases, instructional materials need to be purchased. If a variety of services are expected to be used, a subscription to a suitable program guide could be useful.

Travel—Some distance delivery organizations provide options for remote students to be part of a studio class. Part of the training of facilitators sometimes takes place in the originating site. Conferences are available to enrich staff understanding. Consideration should be given to a budget to take advantage of such opportunities.

Budget

As is evident from the system descriptions in previous sections, a wide variety of fee structures is employed by the vendors of distance education courses and services. Some charge for items which others do not, and some have memberships while others do not. It is difficult to compare two systems which offer the same course or similar service but have different fee structures without working out an actual example of each. Some organizations such as Ed-Net in Oregon require a commitment for longer than a year.

The form on the next page is provided as a guide for obtaining a general total of costs from a single service, so that the net result of applying two different fee structures can be compared. It is designed to be generally applicable to a range of different options, and, therefore, might contain some items which don't apply in some cases. It is also designed to be a reminder of some factors which result in costs to the district but which are not typically included in vendor fee structures, so that the total cost of a plan is revealed.

The cost of some items such as phone lines and staff vary from one locale to another, even within a state, and will have to be obtained locally. We are unable to provide accurate figures for the region as a whole. The reader may find it necessary to add items to the form to suit local conditions and factors.

Distance Education
Cost Planning Worksheet

Delivering Organization:_____

Membership Fee $_____

Course Fees:

Title 1 _____ _____Stu. x $_____ = _____

Title 2 _____ _____Stu. x _____ = _____

Title 3 _____ _____Stu. x _____ = _____

Inservice Courses _____ Teachers x _____ = _____

Instructional Materials: Purchase and duplication _____

Equipment:

Satellite Antenna _____

Satellite Tuner _____

Classroom TV, VCR, etc. _____

Computer, peripherals and software
(some courses may require several) _____

Phone Line:

Installation _____

Monthly Line Charge _____

Long Distance Charges _____

Maintenance and Replacement _____

Facilitator/Monitor _____

Travel, Conference _____

TOTAL $_____

EVALUATION

Educators planning to use distance education as a part of the school curriculum are faced with choices among delivery systems and among courses in the same subject from different systems. In some states, policy in law or administrative rules requires local districts to evaluate courses prior to selection or during use. Also, teachers and other district staff may be involved in the development of instruction to be delivered by distance technologies.

The guidelines in this document are intended to support all of those purposes. They have been assembled by the Technology and Rural Education Programs of the Northwest Regional Educational Laboratory from a number of documents which present instructional design and evaluation criteria, and from their on-site assessment of the effectiveness of selected courses from the EDUNET and STEP distance education systems in the northwest region. These guidelines are a starting point, and will be reviewed periodically to incorporate modifications occasioned by use and research. References for further information are available from the Technology Program.

Objectives

Learning objectives are expressed which:

- are clearly stated in terms of learner outcomes (knowledge, skills, attitudes)
- include higher-order thinking skills and the affective domain
- are written from the student's point of view
- have a consistent scope (are relatively equal in amount of material or work to cover)
- imply or state an appropriate level of difficulty
- are written with a performance measure in mind

Content

Concepts are organized in a logical manner.

Content is comparable to that of a traditional classroom course.

The information is developmentally appropriate for age or grade.

The information is current and accurate.

Content corresponds to the objectives established.

The scope is appropriate, and the coverage is comprehensive within those bounds.

Content is free-standing, requiring little if any outside resources or information.

Instructional Design

Teaching strategies include all modalities: Visual, auditory, tactile.

Strategies reflect effective teaching research: frequent review, guided practice, extensions (enrichment), and correctives (reteaching).

Attention is given to learning styles of the target age group.

Lesson or unit size is appropriate for self-directed learning.

Lessons or units are arranged in a logical sequence.

A suggested pace of progress appropriate to the target audience is included.

Optional learning activities are included for use after criterion test failure or at other appropriate points.

Learner interaction with content is encouraged:

- Challenging questions are posed
- Written assignments are required
- Critical viewing, reading, and thinking are stimulated

Instructional Materials

Materials are selected to address different learning modalities: visual, auditory, and tactile.

A variety of instructional materials are used: print, computer software, audiotape, videotape.

The purpose of the materials and their relation to objectives are clear.

Materials are identified or provided to support options for enrichment and remediation.

Materials are identified or provided to support frequent review and guided practice.

Print materials have an appropriate vocabulary and reading level.

Recommended and provided materials are consistent with state and local standards and selections.

Evaluation

Formative tests are administered frequently.

Summative tests are presented at appropriate points.

Tests are related to instructional objectives.

Practice tests for self-assessment are available in paper form.

Grading standards are clear and fair.

Facilitator Guidelines

A set of guidelines are provided which will assist the school course facilitator in providing effective student support and guidance. The following items should be included:

- Responsibilities of the facilitator
- Learning objectives
- Content outline for the entire course or unit
- Prerequisites expected of students
- Expectations for pacing and completion time
- Optional instructional approaches, materials and activities
- Teacher contact information, including times available
- Grading approach, philosophy, and local options
- Special requirements for equipment and facilities

GLOSSARY OF TERMS

ASCII—A standard code for the transmission of alphabetic, numeric, and other characters in computers and telecommunications systems. (American Standard Code for Information Interchange)

Amplifier—A device used in telecommunications systems to restore to its original level a signal which has deteriorated over a distance.

Antenna—In a satellite system, the receiving antenna is a disk shaped with a parabolic curve. A standard antenna for C-band has a diameter of about three meters, and a Ku band signal requires a diameter of one to two meters.

Audiographic—A system which transmits both an audio signal and computer graphics on the same telephone cable. Equipment includes a computer, graphics tablet, and speaker-phone at delivering and receiving ends, and some additional communications devices. A television signal is not part of the system.

Band Width—The size of a telecommunications band in cycles or bits per second which defines the capacity of a medium such as copper wire or fiber optic cable to carry signals. The larger the band width, the greater the number of signals which can be transmitted simultaneously, or the greater the amount of information which can be sent at one time. Video signals require greater band width than audio because there is more information in a picture.

Baud—Baudot code, a scale for expressing the rate of transmission of information in defined sets. For example, 1200 baud is 1200 bits per second, where one bit is one set of information.

Bit—One binary digit, expressed numerically as a 0 or 1, or as a brief change in signal intensity on a telecommunications line.

C-Band—A band of telecommunications frequencies reserved for satellite transmission (3700-4200 MHz from satellite to earth). This band requires a larger receiving dish antenna than Ku band, is less prone to signal loss in rain or snow, and is more prone to microwave interference.

Channel—A basic unit of service in a telecommunications system, usually a narrow bandwidth such as 6 MHz for a television channel.

Coaxial—A cable having a copper-clad aluminum core with insulation to minimize loss of signal and interference. It can handle higher frequencies for longer distances than twisted pair.

Codec—Coder-decoder, a device for changing a video signal from analog to digital or the reverse, as the signal passes between a transmission device and cable or other medium. The purpose is similar to that of a modem in an audio signal.

Converter—A device that translates nonstandard frequencies between channels 6 and 7 and above channel 13 to an unused VHF channel, extending the channel capacity of a cable system.

Direct Broadcast Satellite (DBS)—A satellite equipped to transmit a strong signal in a concentrated beam, which enables a school or other location to receive signals with a relatively small dish antenna.

Downlink—A receiving station for a satellite signal, usually a parabolic dish antenna and other equipment to carry the signal to a television set.

Downstream—Cable signals travelling from the headend to the subscriber or receiving site.

Fiber Optic—A type of cable made of many glass fibers, each of which carries a signal generated by a light source such as a laser. The light flashes on and off, creating a combination of bits. It has much greater capacity than coaxial or twisted pair.

Footprint—The area on earth within range of a satellite-transmitted signal.

Headend—The master control center of a cable system, which distributes the signals from the satellite antenna or other source to the cable users.

Ku Band—A band of telecommunications frequencies reserved for satellite transmission (11700-12200 MHz from satellite to earth). This band requires a smaller dish antenna than C-band, is more prone to signal loss from rain or snow, and is less prone to terrestrial microwave interference.

MHz—Megahertz. Hertz (Hz) is the name of a unit of measure of a signal in cycles or waves per second. One MHz is one million waves per second. One GHz is one billion waves per second. A human ear typically operates in the range from about 16 Hz to 16 Kilohertz (KHz), or 16 to 16,000 waves per second.

Modem—Modulator-demodulator, a device used to change a computer-generated signal to an audio signal which can be carried on a telephone line, or the reverse.

MSO—Multiple System Operator, a company or organization owning several cable delivery systems.

Narrowcasting—Television programming designed for a specific target audience.

Polarization—A technique to increase the capacity of satellite transmitters. In linear polarization, half the signals are generated horizontally and half vertically, with no interference resulting.

Slow Scan—A form of television in which an image is scanned and transmitted only once every minute or so instead of many times a second as in a regular television broadcast. The receiver sees an image change slowly, as in viewing a series of slides. The advantage is that the signal can be transmitted inexpensively over telephone lines.

Teletext—Distribution of textual data by broadcast television, in the vertical blanking interval.

Transponder—The receiver/transmitter combination within a satellite, which receives the signal from an uplink, amplifies it, and retransmits it to a downlink. There are many transponders in one satellite, each representing one video channel.

Tuner—Part of the receiving apparatus in a downlink site to focus on the signal.

Twisted Pair—The term used to describe the common telephone cable, composed of two copper wires twisted to form a cable for one phone line, with many pairs combined in a large cable to serve more phones.

Uplink—A station for transmitting a signal to a satellite, sometimes called an earth station. It includes a parabolic dish antenna and other related equipment.

Upstream—Cable signals travelling from a subscriber site to the headend.

Vertical Blanking Interval—A portion of a standard broadcast band or channel, which is unused by the television signal, and available to carry other information.

Videotex—Distribution of textual data by a cable system.

VSAT—Very Small Aperture Terminal, a receiving antenna of about one meter in diameter.

NORTHWEST REGIONAL EDUCATIONAL LABORATORY

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Executive Director

Ethel Simon-McWilliams
Associate Director

Education and Work Program
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Joe Coburn, Director

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School Improvement Program
Bob Blum, Director

Technology Program
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The Education Profession Program
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Western Center for Drug-Free School and Communities
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Joe Jones, Director

The Northwest Regional Educational Laboratory (NWREL) is an independent, nonprofit research and development institution established in 1966 to help others improve outcomes for children, youth, and adults by providing R&D assistance to schools and communities in providing equitable, high quality educational programs. NWREL provides assistance to education, government, community agencies business, and labor by:

- Developing and disseminating effective educational products and procedures
- Conducting research on educational needs and problems
- Providing technical assistance in educational problem solving
- Evaluating effectiveness of educational programs and projects
- Providing training in educational planning, management, evaluation, and instruction
- Serving as an information resource on effective educational programs and processes, including networking among educational agencies, institutions, and individuals in the region

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Attorney
Great Falls, Montana

George Benson
Superintendent
Centennial School District (Oregon)

Judith Billings
Washington Superintendent of Public Instruction

Jacob Block (Vice Chairman)
Superintendent
Missoula Elementary District (Montana)

Susanne Boedecker
Boedecker Resources
Glendive, Montana

Raina J. Bohanek
Teacher
Coeur d'Alene School District (Idaho)

Gale Castillo
Consultant
Portland, Oregon

Marcia Christian
Teacher
Battle Ground School District (Washington)

Gerald B. Covey
Commissioner
Alaska Department of Education

Nancy Dees
Puyallup School Board (Washington)

Marilynne Eichinger
President
Oregon Museum of Science and Industry

Jerry L. Evans
Idaho Superintendent of Public Instruction

Allen Glenn
Dean, College of Education
University of Washington

Marlys Henderson
English Teacher
Fairbanks North Star Borough School District (Alaska)

William Hensley
NANA Development Association
Anchorage, Alaska

Shirley Holloway
Associate Professor
University of Alaska, Anchorage

Carole Huntington
Secretary-Treasurer
Alaska Association of School Boards

Raye Johnson
Public Participant
Bellevue (Washington)

Spike Jorgensen
Superintendent
Alaska Gateway School District

Homer Kearns
Superintendent
Salem-Keizer School District (Oregon)

Nancy Keenan
Montana Superintendent of Public Instruction

John Kohl
College of Education
Montana State University

Laurie A. Lamson
Deputy Director
Montana Job Training Partnership, Inc.

Gary Locke
State Representative
Washington State Legislature

Rosiland Lund
Teacher
Hillsboro Union High School District (Oregon)

Terry McCall
Vice President and District Manager
U.S. Bank, Gresham (Oregon)

Joe McCracken
Superintendent
Lockwood Elementary District (Montana)

Zola McMurray
Business Woman
Lewiston, Idaho

Nancy W. Oltman
Director, EEO/Affirmative Action
Weyerhaeuser Company (Washington)

Barney C. Parker (Chairman)
Superintendent
Independent District of Boise (Idaho)

David Peck
Superintendent
Pocatello School District (Idaho)

Dennis Ray (Secretary-Treasurer)
Superintendent
Northshore School District (Washington)

Representative of
Oregon Superintendent of Public Instruction

Patricia Rylander
Principal
Manchester Community School
Port Orchard, Washington

James Scott
Headmaster
Catlin Gabel School
Portland (Oregon)

Bonnie Speare
Teacher
Livingston School District (Montana)

Brian Talbott
Superintendent
Educational Service District 101
Spokane (Washington)

Linda Vaughey
Vice President
Montana School Boards Association

Christine Wada
Public Participant
Blackfoot, Idaho

Robert Walp
Vice Chairman
General Communications, Inc. (Alaska)

Bill Wyatt
President
Oregon Business Council

Northwest Regional Educational Laboratory
101 S.W. Main, Street, Suite 500
Portland, Oregon 97204-3297
(503) 275-9500 GTE: NWREL.LAB FAX: (503) 275-9489

03/92